Developing trees out of our cities

A study on the effects of city redevelopment on urban forests

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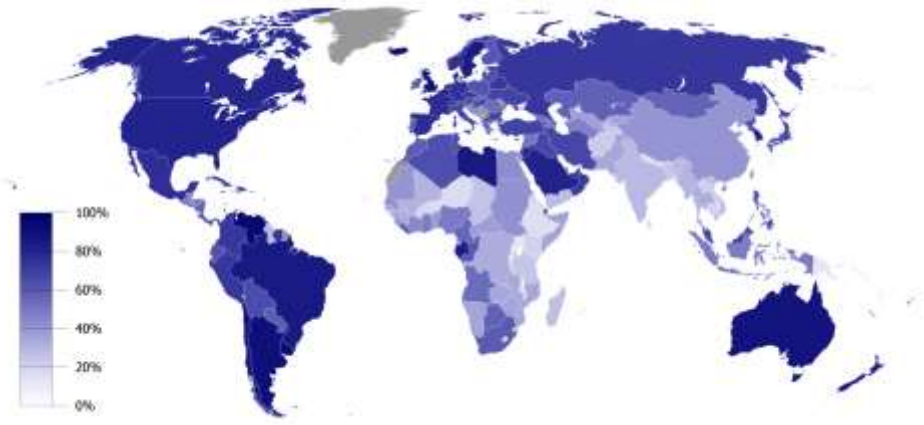
Global Urbanization



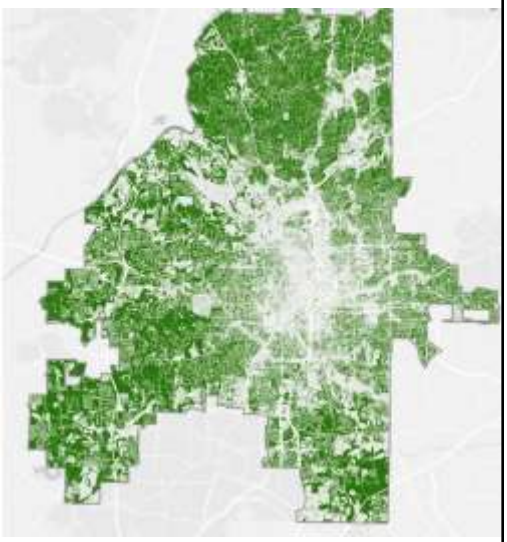
The Developing City

- Redevelopment is a journey, not a destination
  - Amalgamation or subdivision of existing property boundaries
  - Replacement of aging buildings with newer, larger buildings
  - Usually leads to densification or intensification
- Are we developing greenspaces out of our cities?

Urbanization and the Urban Forest

Urban-rural gradient studies show decline in tree canopy cover moving from rural fringe to urban core

'Green donut' effect



Development's Effect on the UF

We know the outcome for tree canopy cover but…

*We have a poor understanding of **why** development leads to a loss of tree cover*

Addressing the Knowledge Gap

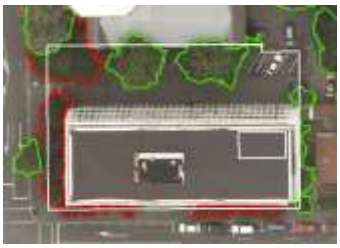
- What happens to trees on a property when it is redeveloped – are they removed or retained?
- Why are trees removed or retained during redevelopment?

Methods

- Before/after approach to measure effect of demolition on tree cover
- Done at the property level, rather than city level

Methods

- Site visits at 123 properties used to survey tree cover and presence/absence for 1209 trees



- Difference between aerial imagery and post-demo survey used to quantify tree cover loss

Results – The Big Picture

- A loss of roughly 1/5 of existing canopy cover
- Before demolition
  - 17.8% canopy cover
- After demolition
  - 14.3% canopy cover

e.g. Complete Tree Retention






e.g. Significant Tree Removal




Tree Loss

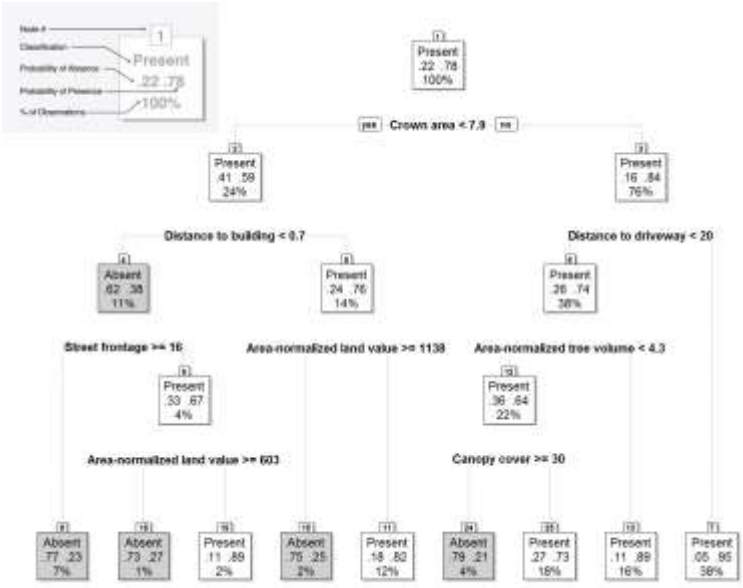
- 948 trees retained (78.4%)
- 261 removed (21.6%)

- What factors led to decisions?

Explanations for Tree Removal

	Variable
Tree Variables	Crown area (m^2)
	Height (m)
	Volume (m^3)
	Canopy cover (%)
	Area-normalized tree volume (m)
	Total tree count
	Tree density (trees/m^2)
Property Variables	Distance to building (m)
	Distance to driveway (m)
	Distance to street (m)
	Property area (m^2)
	Property area:perimeter ratio
	Street frontage (m)
	Building cover (%)
Economic Variables	Area-normalized land value (NZ $/$m^2$)

Results - Classification Tree Analysis



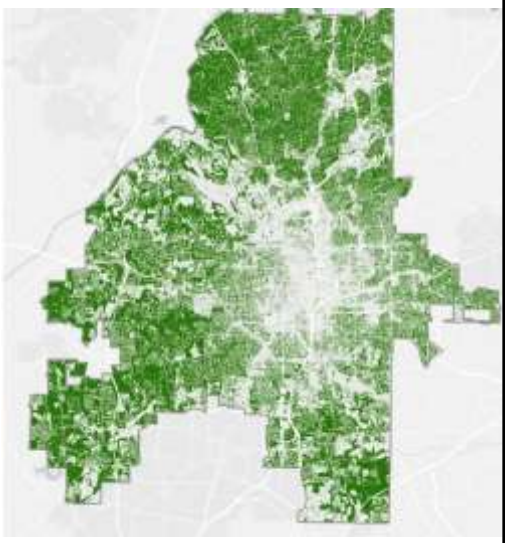
Presence/Absence – Highlights

- Trees were 2.6 times more likely to be absent than present if their crown area was less than 7.9 m^2
- Small trees were 2.6 times more likely to be absent if they were closer than 0.7 m to demolished buildings
- Large trees were 5.2 times more likely to be absent if they were closer than 20 m to a driveway
- Trees were 4.2 times more likely to be absent if the land value exceeds \$1138/m^2

Implications

How do the results contribute to our understanding of urbanization's effect on tree canopy cover?

Is the 'green donut' pattern explained by the results?



Urbanization's Effect on the UF

- Overall tree canopy cover declines after demolition due to loss of individual trees
- Tree removal increased:
  - Near buildings
  - Near driveways
  - On expensive land
- These conditions are typical of central city areas




Redevelopment will continue in our cities. How do we retain trees during redevelopment to avoid the 'green donut' effect?

Thank You

Questions to:

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